THE DEVELOPMENT OF A TECHNOLOGY OF BONELESS READY-TO-COOK MEATS FROM HOT BEEF

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The aim of the present study was to develop a cost-effective industrial technology of natural ready-to-cook meats from hot beef.

As the object of the study served 400-420 kg beef carcasses of 13-month-old animals (raised at a commercial feeding complex), as well as M.longissimus dorsi dissected from these carcasses.

The expediency of hot carcass cutting and vertical deboning using the installation Я4-ФАФ has been experimentally proved.

The advantages of ready-to-cook meats chilling at -1 to +1°C just after cutting and packing within 2-2.5 hr post mortem are shown.

On the basis of physico-chemical, microstructural and organoleptical indices cold-storage time up to 15 days at -1 to +1°C and up to 7 days at 4 to 6°C was recommended.

Technological process for natural boneless read-to-cook meats from hot beef has been suggested and tested under commercial conditions.

One of the ways of eliminating the problem of reducing meat shrinkage during chilling, storage and transportation is to process hot meat.

The aim of the present study is to utilise hot beef for boneless ready-to-cook meats production and the development of a cost-effective technology on this basis.

The research was conducted on the 400-420 kg beef carcasses of 13-month-old animals, raised at a commercial feeding complex.

Sides were hot-boned vertically in an installation Я4-ФАФ in compliance with the approved technological specification.

Tests were made on the longissimus dorsi muscles.

Test samples (versions 1, 2 3; see below) were dissected from hot muscles, controls - from muscles, chilled traditionally.

L.dorsi was divided into 200-600 g pieces and were used for tests.

Muscle sampling followed a strict succession, starting from the blade of the side.

At predetermined intervals the samples having the same number were selected from each test version. They were weighed to the nearest 1 g, vacuum-packed using "Multivac", chilled for 2-2.25 hrs down to the internal meat temperature at least +4°C and stored at -1 to +1°C for 10 days.

Version 1: - hot beef samples were weighed, vacuum-packed, immediately chilled and stored; version 2 - hot beef samples were weighted, vacuum-packed, aged at 22-26°C for 6 hours, chilled and stored; version 3 - a hot side was aged at 22-26°C for 6 hours, l.dorsi was excised, cut into samples, which were weighed, vacuum-packed, chilled and stored; version 4 (control) - a side was chilled in a 0 to 4°C cooler for 24 hours. Then the longissimus dorsi muscle was excised, cut into samples, which were weighed, vacuum-packed and stored.

A test with preliminary ageing of hot beef before chilling was necessary to determine ageing effect o the qualities of packed ready-to-cook meats.

pH, waterbinding capacity, drip loss, shear force were measured; samples were studied microbiologically, histologically and organoleptically.

The regularity of sampling was as follows: the initial hot meat; samples after 1, 3, 5, 7 and 10 days of storage at -1 to 1°C.

The results of a comparative study of the selected test versions showed that waterholding capacity (WHC) in the first version is significantly higher than in the third one ($tp > t_{Table} = 2.09$, $\alpha = 0.05$, f=19).

The orientation of changes in WHC is similar for all the test and control samples both during the first and the following days of storage.

Changes in drip loss during storage are shown in Figure 2. It was established that the least drip loss was observed on the 3rd, 5th, 7th and 10th day of storage in case of test samples of version 1 and that it was 1.5-2 times as lower as compared to the controls (version 4) and to the test samples (version 2 and 3).

Drip loss in version 1 is significantly lower than that of other versions ($tp >_{Table} = 3.18$, $\alpha = 0.05$, f=3).

The data on the pH change during packed meat storage indicated that most intensively pH falls in all the samples during the first day of storage (6.25-5.8). Within the following two days pH continues to drop slightly, on the fifth day it becomes somewhat higher and then remains at the same level (5.8).

The pH in the first version is significantly higher than those in versions 2, 3, 4 ($tp > t_{Table} = 2.77$; $\alpha = 0.05$; f=4). The data obtained coincide with the earlier results which indicated that the muscle protein condition of packed meat changed against the background of a somewhat retarded alterations of hydrogen ions concentration. Obviously, under low partial oxygen pressure some special environment in the package influences the protein system of chilled meat due to predominant growth of lactobacilli.

Organoleptical scores (9-point scale) of cooked meat samples (variants 1, 2, 3) after 10-day storage are practically the same (6.52; 6.57; 6.55), being slightly higher (7.17) in case of controls (version 4).

The difference in organoleptical scores of cooked meat is statistically insignificant ($tp < t_{Table} = 3.18$; $\alpha = 0.05$; f=3).

Organoleptically, the broth prepared from the sample of version 2 is evaluated significantly higher (7.16) than that of version 3 (6.30); samples of version 1 and 4 do not differ from each other ($tp<t_{Table}=4.3$; $\alpha=0.05$; f=2).

The analysis of the shear force data showed that after 10-day storage there was no significant difference between cooked meat of versions 1, 2 and 3, 4 ($tp<t_{Table}=3.18$; $\alpha=0.05$; f=3).

It is necessary to note, that the shear force of the samples of versions 1 and 2 is relatively higher than that of versions 3 and 4 (Table).

Version	x	s	v	m
1	2.81	1.11	39.50	0.55
2	2.11	0.91	43.51	0.45
3	1.51	0.72	47.95	0.36
4	1.19	0.28	23.75	0.14

Microbiological tests showed the absence of microorganisms in hot beef and low bacterial contamination in packed meat after 10 days of storage ($2.8\cdot10^2$ up to $4.5\cdot10^2$cells per cm_2).

As for the total bacterial count, there was no pronounced difference between meat samples of versions 1, 2, 3, 4; they were microbiologically safe.

On the basis of histological examination it was established that ageing of vacuum-packed meat after 3-5-day cold storage proceeded at different rates: more intensively in meat pre-aged in sides before cutting and packing at plus temperatures (sample of version 3), less intensively in controls (cutting and packing of chilled meat - sample 4) and even more slowly in hot packed meat (sample of versions 1). These differences are levelled by the 7th day of storage.

Out of all versions studied, version 1 is preferred, which means hot meat packing followed by immediate chilling and storage.

To establish optimum storage time of beef boneless ready-to-cook products prepared from hot meat, temperature conditions and storage time were investigated.

Storage and sale periods of boneless vacuum-packed meat were determined.

On the basis of physico-chemical, microstructural and organoleptical results cold storage life was determined to constitute up to 15 days at -1 to 1°C and 7 days at 4 to 6°C.

The performed complex research made it possible to substantiate a new technology of boneless ready-to-cook products from hot beef, this technology reducing losses, improving their quality and cold storage life.

Table

Version	$\bar{x}$	s	v	m
I	2.8I	I.II	39.50	0.55
2	2.II	0.9I	43.5I	0.45
3	I.5I	0.72	47.95	0.36
4	I.I9	0.28	23.75	0.I4

Microbiological tests showed the absence of microorganisms in hot beef and low bacterial contamination in

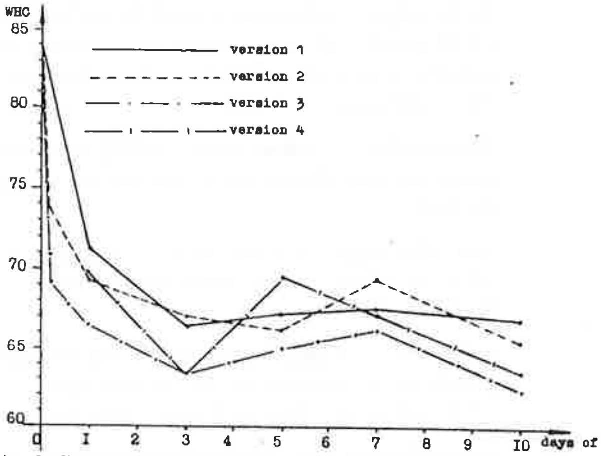

Fig. 1 Changes in WHC during storage (mean values for 4 series).

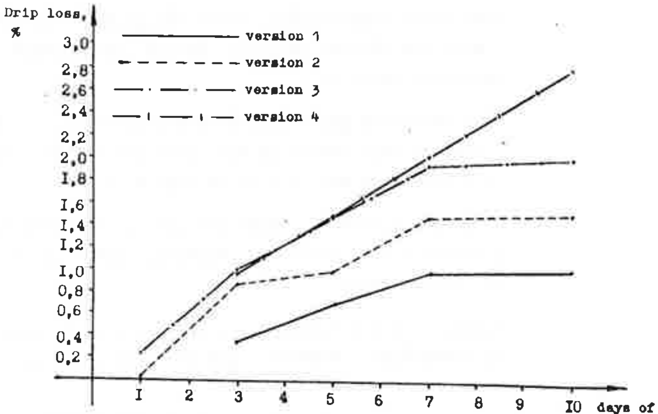

Fig. 2. Drip loss during storage (mean values for 4 series).